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(71) Applicant *(for all designated States except US)*: **KVAERNER PULPING AB** [SE/SE]; Box 1033, S-615 15 Karlstad (SE).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **SNEKKENES, Vidar** [NO/SE]; Herrhagsgatan 62, S-652 19 Karlstad (SE).

(74) Agent: **FURHEM, Hans**; Kvaerner Pulping AB, Box 1033, S-651 15 Karlstad (SE).

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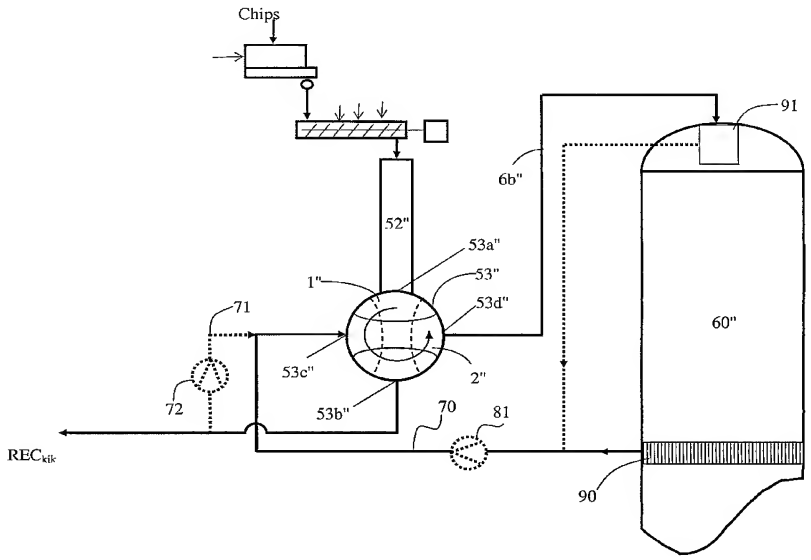
(54) **Title:** FEED OF A MIXTURE OF CHIPS AND FLUID FROM A LOW-PRESSURE SYSTEM TO A HIGH-PRESSURE SYSTEM



(57) **Abstract:** The invention concerns an improved method to sluice chips from a low-pressure section to a high-pressure section with a sluice feeder 53" (a high-pressure feeder). The fluid that is used to expel the chips from the sluice feeder 53" principally comprises pressurised fluid withdrawn from the treatment vessel 60", which pressurised fluid is normally withdrawn from the treatment vessel 60" for recovery (REC). By using this pressurised fluid instead to expel the chips from the sluice feeder 53" and subsequently sending the previously pressurised fluid to the recovery system (REC), the requirement for high-pressure pumps that consume large quantities of electrical energy can be considerably reduced.

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Feed of Cellulose Chips

Technical Area

The invention concerns a method for the feed of cellulose chips during continuous cooking according to the preamble of claim 1.

The Prior Art

When cooking cellulose chips in continuous digesters, the chips are transported from a feed system at atmospheric pressure or a pressure slightly above atmospheric pressure to an impregnation vessel or a digester in which the pressure is considerably higher, through what is known as a "transfer flow". Transport in the transfer flow is made possible in that the chips are formed into a slurry with a transport fluid, preferably a process fluid, which is subsequently separated from the chips in separation equipment, normally designated as a "top separator", when the chips have reached the impregnation vessel or the digester. The transport fluid is recirculated to the feed system through a return line. The transfer flow has comprised for a long time a special type of sluice feed, known as a "high-pressure feeder", that has been specially designed to resist and separate the large differences in pressure that exist between the two systems. This high-pressure feeder is equipped with a rotor with symmetrical through pockets that are placed alternately in connection with the low-pressure system and the high-pressure system when the rotor rotates, without there being allowed any form of communication between these systems. The chips can in this manner be transferred from one system with no excess pressure or at a low excess pressure, typically 0-4 bar (abs), and fed through the high-pressure feeder into a system with considerably higher pressure, typically 7-20 bar (abs).

Figure 1 shows schematically a conventional feed system according to the prior art with a high-pressure feeder 33 and a bin flow 34, a transfer flow 6a, 45 and a return flow 50. The transfer flow is constituted by a transfer line 6a for the transport of chips that have been formed into a slurry with a transport fluid, and a return line 45 for the transport fluid. The transfer line 6a connects at its upper end to a top separator 47 arranged at the top of a treatment vessel 48 where

excess transport fluid is separated from the chips, after which the transport fluid is returned to the high-pressure feeder 33 through the return line 45. The top separator 47 is symbolised here by a version that is fed downwards in a treatment vessel that is filled hydraulically, or by some other separation equipment arranged in the transfer line or at the upper section of the treatment vessel.

The return flow 50 controls the level of fluid in the chip bin 32 and ensures that sufficient fluid is available in order to feed the chips out from the high-pressure feeder 33.
Since the return flow 50 passes from low pressure to high pressure, at least one high-pressure pump 51 is required to be arranged in the return flow 50.

A major disadvantage of this design is that the high-pressure pump 51 must consume large amounts of electrical energy in order to transport chips from the chip bin 32 to the treatment vessel 48.

Figure 2 shows a method according to SE 519262 with the aim of reducing the problems and disadvantages described above. A minimum amount of fluid is used in this case to transport the chips in the transfer line 6b' and the fluid can in this way be allowed to accompany the chips to the subsequent treatment vessel 60'. Thus, no return line and no associated pumps, valves or equipment for transport fluid are required, making the feed system cheaper than conventional feed systems. The high-pressure feeder 53' is fed with a mixture of chips and fluid from a chip bin 52' in which an L/W-ratio of between four and ten is established through the active addition of fluid LIQ_A. A conventional high-pressure feeder 53' is placed after the chip bin, and is equipped with a rotor with symmetrical through pockets (1, 2) that are alternately placed in connection with the chip bin 52' and the transfer line 6b'. When one of the pockets of the rotor opens by gradual rotation towards the chip bin 52' it becomes filled by the fluid that in the previous position fed the chips mixture out into the transfer line 6b'. The pocket facing the opposing flow line 54' opens at the same time and an open channel through the high-pressure feeder is created. The pocket is placed in the first position when it is located in this filling

position.

Under the influence of one or more high-pressure pumps 57', 57" or under the influence of one pump with several pumping stages in the flow line 54', and under the influence of the static pressure that is formed by the column of fluid in the chip bin 52', the fluid in the pocket 1 will be extracted/expelled by suction at the same time as the chips mixture is fed into the pocket.

Furthermore, it can on occasions be desirable to add a makeup fluid LIQ_B to the flow line 54'. This makeup fluid LIQ_B is characterised by not being to any degree part of a withdrawal from subsequent separation equipment connected to the treatment vessel 60'.

The disadvantage of this design is that the high-pressure pumps mentioned above consume very large quantities of electrical energy.

Aim and Purpose of the Invention

The principal aim of the present invention is to offer a method that consumes little energy during the transport of chips mixture from a feed system that functions at a first, low pressure and that comprises a high-pressure feeder for the sluice feed of chips mixture to a treatment vessel in a cooking system for the continuous cooking of chemical cellulose pulp that functions at a second, higher pressure.

This is achieved according to the invention through a method that demonstrates the characteristics specified in claim 1.

A further aim is to fully or partially remove the requirement for high-pressure pumps, which consume large amounts of electrical energy. These high-pressure pumps are described above in the summary of the prior art.

A further aim is to fully or partially exploit the pressurised fluid withdrawn from a subsequent digester or impregnation vessel at a pressure that is essentially maintained and that corresponds to the pressure established in these, which fluid withdrawal normally passes to a recovery system through a pressure-reducer, and instead to use these pressurised fluids in order to transport chips

out from the high-pressure feeder.

Brief Description of the Invention

The invention is characterised in that it fully or partially reduces the requirement for high-pressure pumps in order to pump fluid from low pressure to high pressure in association with the transport of chips from a chip bin to a treatment vessel. These high-pressure pumps, which consume a large amount of electrical energy, have been described in more detail above in the description of the prior art.

This is achieved through exploiting, fully or partially, the pressurised fluid withdrawn from the treatment vessel, which is normally withdrawn and passed to a recovery system, and using instead this pressurised fluid to expel chips from the high-pressure feeder, before the previously pressurised fluid is passed to the recovery system, either directly or via a chip bin or an impregnation vessel.

The amount of fluid that passes to the recovery system after the high-pressure feeder is equivalent to the amount of fluid that is required to pump up to high pressure by means of a high-pressure pump in the prior art.

The requirement for large amounts of electrical energy that is required for the use of high-pressure pumps according to the prior art can, according to the invention, be reduced by up to 50%.

The saving in the pumping power required is proportional to the portion that is withdrawn under pressure from the digester and that during its passage through the sluice feeder is later led to the recovery system, either directly or via a chip bin or impregnation vessel.

The pressurised portion has in this case been used to raise the pressure of the chips suspension at the removal position, and since this portion is passed to the recovery system it does not need to be repressurised with a return line 71, 72.

Further characteristics and aspects, together with advantages, of the invention are made clear by the attached claims and by the detailed description of a number of embodiments given below.

Description of the Drawings

The prior art is described with reference to Figure 1 and Figure 2, where

Figure 1 shows schematically a conventional feed system with a high-pressure feeder and a bin flow and a transfer flow;

Figure 2 shows schematically a feed system according to subsequently developed technology without a bin flow and a transfer flow with a return line (according to SE 519262);

Figure 3 shows a first, a second and a fifth preferred embodiment according to the invention;

Figure 4 shows a third and a fifth preferred embodiment according to the invention;

Figure 5 shows a fourth and a fifth preferred embodiment according to the invention.

Detailed Description of Preferred Embodiments

The concept of "treatment vessel 60"" will be used in the following description of preferred embodiments. The treatment vessel 60" can be either a pressurised digester or a pressurised impregnation vessel.

The concept "pressurised fluid" will also be used. The term "pressurised fluid" is here used to denote a pressurised withdrawal of fluid that has been taken from a treatment vessel 60" and that is characterised in that it is pressurised and maintained at a pressure level that essentially corresponds to the pressure that has been established in the treatment vessel 60". This pressurised fluid can be withdrawn from a top separator 91 on a treatment vessel 60" or from a strainer 90 on a treatment vessel 60" at a position in the treatment vessel 60" at which the chips have had a retention time greater than 60 minutes, preferably greater than 100 minutes.

Furthermore, the concept "previously pressurised fluid" will be used. The term "previously pressurised fluid" is here used to denote pressurised fluid that has been used in order to empty the sluice feeder 53 at its high-pressure position (the emptying position), the pressure of which is subsequently reduced at the subsequent rotation of the pocket of the sluice feeder to the low-pressure position, whereby this fluid has passed the sluice feeder 53 and thus is no longer under pressure.

Finally, the concepts "recovery REC_{kik}", "recovery REC_{extr}" and "recovery REC_{tot}" will be used.
The term "recovery REC_{kik}" is here used to denote a portion of the previously pressurised fluid that has been used to empty the sluice feeder 53, where this portion is subsequently forwarded directly to the recovery system or indirectly to the recovery system via a black liquor impregnation or a pre-impregnation.
The term "recovery REC_{extr}" is here used to denote a fluid withdrawal that has been withdrawn from a chip bin 52" or from an impregnation vessel 60" and where this fluid is forwarded to a recovery system.
The term "recovery REC_{tot}" is here used to denote the total amount of all fluids from the treatment vessel 60" that are forwarded to the recovery system or to black liquor impregnation or pre-impregnation.

The fluids that are withdrawn via REC_{kik} and REC_{extr} for recovery cannot exceed REC_{tot} and they cannot exceed the amount of new fluid that is fed into the system together with the chips.

Figure 3 shows a first preferred embodiment according to the invention in the form of a method for the feed of a mixture of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp. The feed of fluid and cellulose chips between these systems takes place through a sluice feeder 53". The sluice feeder 53" is equipped with a first inlet 53a", a second inlet 53c", a first outlet 53b" and a second outlet 53d". The sluice feeder 53" further comprises a rotor with a first 1" and a second 2" through pocket, which are placed alternately in connection with the high-pressure system and the low-pressure system.

The first pocket 1" is located at a first position and is placed via the first inlet 53a" in connection with a chip bin 52" while the pocket 1" is filled with the chips mixture, while at the same time expulsion of the fluid that is present in the pocket 1" takes place via the first outlet 53b".

The second pocket 2" is located at a second position and is placed via the second outlet 53d" in connection with a transfer line 6b" in the high-pressure system, while the chips mixture is fed out from the pocket 2" for transport onwards to a treatment vessel 60" in the high-pressure system with the aid of a fluid that is fed into the pocket 2" through the second inlet 53c".

The second inlet 53c" is connected via at least one withdrawal line 70 to the treatment vessel 60", from which pressurised fluid is withdrawn. At least a portion of this pressurised fluid is withdrawn from the treatment vessel 60" with a strainer 90 at a position in the treatment vessel 60" at which the chips have had a retention time greater than 60 minutes, preferably greater than 100 minutes.

In one variant of this embodiment, a portion of the pressurised fluid can also be constituted by fluid withdrawn from a top separator 91 on the treatment vessel 60".

A supplementary pump 81 may be used, where required, to pump the pressurised fluid to the second inlet 53c" of the sluice feed. The pressurised fluid is used to expel the chips mixture from the pocket 1" of the sluice feeder when the pocket is placed in connection with the high-pressure system. The previously pressurised fluid is withdrawn at the first outlet 53b" of the sluice feeder from the pocket 1" and where a portion (REC_{kik}) of the previously pressurised fluid is forwarded to the recovery system and where this portion constitutes at least 20% of the total amount (REC_{tot}) that is passed to the recovery system, while constituting at least 1 m^3/tonne of pulp with the aim of reducing the total amount of electrical energy required to pump the chips suspension from low pressure to high pressure through the sluice feeder 53.

A second preferred embodiment is also shown in Figure 3. It can occasionally be possible that the complete amount of previously pressurised fluid that has been withdrawn from the pocket 1" at the first outlet 53b" of the sluice feeder

(REC_{klk}) is sent to the recovery system, for reasons relating to the process.

Figure 4 shows a third preferred embodiment, in order to establish a desired L/W ratio in the chip bin. In this embodiment, the main part of the previously pressurised fluid after the first outlet 53b" of the sluice feeder on the low-pressure side is allowed to pass to the chip bin, arranged before the sluice feeder 53. This main part of previously pressurised fluid is transported in a bin flow line 73. A pump 74 may be used, where required, to pump the previously pressurised fluid to the chip bin 52". The chip bin 52" has a volume that gives a retention time of the previously pressurised fluid in a chips mixture of at least 10 minutes before the previously pressurised fluid (REC_{extr}) is withdrawn to the recovery system via a recovery line 77 that extends from the withdrawal strainer 78 on the chip bin 52".

Figure 5 shows a fourth preferred embodiment according to the invention in the form of a method for the feed of a mixture of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp. The feed of fluid and cellulose chips between these systems takes place through a sluice feeder 53". The sluice feeder 53" is equipped with a first inlet 53a", a second inlet 53c", a first outlet 53b" and a second outlet 53d". The sluice feeder 53" further comprises a rotor with a first 1" and a second 2" through pocket, which are placed alternately in connection with the high-pressure system and the low-pressure system.

The first pocket 1" is located at a first position and is placed via the first inlet 53a" in connection with an impregnation vessel 3" essentially at atmospheric pressure while the pocket 1" is filled with the chips mixture, while at the same time expulsion of the fluid that is present in the pocket 1" takes place via the first outlet 53b".

The second pocket 2" is located at a second position and is placed via the second outlet 53d" in connection with a transfer line 6b" in the high-pressure system, while the chips mixture is fed out from the pocket 2" for transport onwards to a treatment vessel 60" in the high-pressure system with the aid of a fluid that is fed into the pocket 2" through the second inlet 53c".

The second inlet 53c" is connected via at least one withdrawal line 70 to the

treatment vessel 60" from which pressurised fluid is withdrawn. At least a portion of this pressurised fluid is withdrawn from the treatment vessel 60" with a strainer 90 at a position in the treatment vessel 60" at which the chips have had a retention time greater than 60 minutes, preferably greater than 100 minutes.

In one variant of this embodiment, a portion of the pressurised fluid can also be constituted by fluid withdrawn from a top separator 91 on the treatment vessel 60".

A supplementary pump 81 may be used, where required, to pump the pressurised fluid to the second inlet 53c" of the sluice feed. The pressurised fluid is used to expel the chips mixture from the pocket 1" of the sluice feeder when the pocket is placed in connection with the high-pressure system. The previously pressurised fluid is withdrawn at the first outlet 53b" of the sluice feeder from the pocket 1" and where a portion (REC_{kik}) of the previously pressurised fluid is forwarded to the recovery system and where this portion constitutes at least 20% of the total amount (REC_{tot}) that is passed to the recovery system, while constituting at least 1 m^3/tonne of pulp with the aim of reducing the total amount of electrical energy required to pump the chips suspension from low pressure to high pressure through the sluice feeder 53. The main part of the previously pressurised fluid is passed onwards through a line 75 to the impregnation vessel 3'', which is essentially at atmospheric pressure, arranged before the sluice feeder before a portion (REC_{extr}) of the previously pressurised fluid is forwarded through a line 79 to the recovery system via a withdrawal from a strainer 80 in the impregnation vessel 3", which is at atmospheric pressure.

Finally, a fifth preferred embodiment is shown in Figures 3, 4 and 5 that can be applied on all of the previously mentioned embodiments. It is sometimes desirable from considerations of the process to add a makeup fluid to the second inlet 53c" on the high-pressure side of the sluice feeder. This makeup fluid is a portion (REC_{kik}) of the previously pressurised fluid that was destined for recovery after the first outlet 53b" on the low-pressure side of the sluice feeder. The makeup fluid is transported through a recycling line 71 using at least one high-pressure pump 72.

Alternative Embodiments

With the high-pressure feeder located at a position after a chip bin, it has been traditional to arrange the high-pressure feeder such that its filling process takes place from above when a pocket in its first position has a vertical axis of symmetry, but the method according to the invention is not limited to this method of filling the high-pressure feeder. Filling can also be carried out with the axis of the symmetry of the pocket in a horizontal position. This may be particularly suitable when the high-pressure feeder is arranged after an impregnation vessel. The impregnation vessel is normally placed directly on the ground, due to its size, and thus it is not obvious that there is sufficient space for the filling of the high-pressure feeder from above. If the impregnation vessel is equipped with a bottom scraper, its motor will be centrally positioned under the bottom of the impregnation vessel, and this will probably ensure that it is necessary to place the high-pressure feeder to one side of the vertical axis of symmetry of the impregnation vessel, and it is thus no longer obvious that the filling of the high-pressure feeder is best carried out from above. A horizontal filling procedure may be suitable in this case, and a filling procedure from underneath may be considered.

The invention is not limited to the embodiments described. Several variants are possible within the framework of the claims.

CLAIMS

1. A method for the feed of a mixture of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp in which the feed between these systems occurs in that a sluice feeder (53") is arranged between these systems for the sluice feed of fluid and cellulose chips and where the sluice feeder (53") is equipped with a first inlet (53a"), a second inlet (53c"), a first outlet (53b") and a second outlet (53d"), and it comprises a rotor with through pockets (1", 2"), which are placed alternately in connection with the high-pressure system and the low-pressure system; where the first pocket (1") which is located at a first position is placed in connection in the low-pressure system with a chip bin (52") or with an impregnation vessel (3") essentially at atmospheric pressure while the pocket (1") is filled with the chips mixture, while at the same time expulsion of the fluid that is present in the pocket (1") takes place via the first outlet (53b"), and where the second pocket (2"), which is located at a second position and is placed via the second inlet (53d") in connection with a transfer line (6b") in the high-pressure system while the chips mixture is fed out from the pocket (2") for transport onwards to a treatment vessel (60") in the high-pressure system with the aid of a fluid that is fed into the pocket (2") through the second inlet (53c"), characterised in that the second inlet (53c") is connected via at least one withdrawal line (70) to the treatment vessel (60"), from which treatment vessel (60") pressurised fluid is withdrawn, and that the said pressurised fluid is used to expel chips mixture from the pocket (1") when the pocket is in connection with the high-pressure system and where the previously pressurised fluid is withdrawn from the first outlet (53b") of the sluice feeder from the pocket (1") and where a portion (REC_{kik}) of the previously pressurised fluid is forwarded to a recovery system and where this portion constitutes at least 20% of the total amount (REC_{tot}) that is withdrawn for recovery, while being at least 1 m^3/tonne of pulp, with the aim of reducing the total amount of electrical energy required to pump the chips suspension from low pressure to high pressure through the sluice feeder.

2. The method according to claim 1, characterised in that the principal portion of the previously pressurised fluid is forwarded to a chip bin (52") arranged before the sluice feeder (53), before the portion (REC_{extr}) of the previously pressurised fluid is forwarded to the recovery system via a withdrawal from the chip bin (52").

3. The method according to claim 1, characterised in that the principal portion of the previously pressurised fluid is forwarded to an impregnation vessel (3") essentially at atmospheric pressure arranged before the sluice feeder before a portion (REC_{extr}) of the previously pressurised fluid is forwarded to the recovery system via a withdrawal from the impregnation vessel (3"), which is at atmospheric pressure.

4. The method according to claims 1-3, characterised in that at least a portion of the pressurised fluid is withdrawn from the treatment vessel (60") with a strainer (90) at a position in the treatment vessel (60") where the chips have had a retention time greater than 60 minutes, preferably greater than 100 minutes.

5. The method according to claim 4, characterised in that at least a portion of the pressurised fluid is withdrawn from a top separator (91) on the treatment vessels (60").

6. The method according to claims 1-5, characterised in that a recirculation line (71) comprising at least one high-pressure pump (72) extends from the first outlet (53b") of the sluice feeder to the second inlet (53c") of the sluice feeder for withdrawal of a portion of the previously pressurised fluid that has been expelled from the pockets of the sluice feed when these are located at their first positions, for the addition of this portion as makeup fluid to the second inlet (53c") of the sluice feeder.

7. The method according to claim 1, characterised in that the complete amount (REC_{kik}) of the previously pressurised fluid is forwarded to the recovery system.

ARTICLE 19

PCT/SE04/1985

AMENDED CLAIMS
[received by the International Bureau on 09 May 2005 (09.05.2005);
Claims 1, replaced or changed]

CLAIMS

1. A method for the feed of a mixture of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp in which the feed between these systems occurs in that a sluice feeder (53") is arranged between these systems for the sluice feed of fluid and cellulose chips and where the sluice feeder (53") is equipped with a first inlet (53a"), a second inlet (53c"), a first outlet (53b") and a second outlet (53d"), and it comprises a rotor with through pockets (1", 2"), which are placed alternately in connection with the high-pressure system and the low-pressure system; where the first pocket (1") which is located at a first position is placed in connection in the low-pressure system with a chip bin (52") or with an impregnation vessel (3") essentially at atmospheric pressure while the pocket (1") is filled with the chips mixture, while at the same time expulsion of the fluid that is present in the pocket (1") takes place via the first outlet (53b"), and where the second pocket (2"), which is located at a second position and is placed via the second inlet (53d") in connection with a transfer line (6b") in the high-pressure system while the chips mixture is fed out from the pocket (2") for transport onwards to a treatment vessel (60") in the high-pressure system with the aid of a fluid that is fed into the pocket (2") through the second inlet (53c"), characterised in that the second inlet (53c") is connected via at least one withdrawal line (70) to the treatment vessel (60"), from which treatment vessel (60") pressurised fluid is withdrawn, and that the said pressurised fluid is used to expel chips mixture from the pocket (1") when the pocket is in connection with the high-pressure system and where the previously pressurised fluid is withdrawn from the first outlet (53b") of the sluice feeder from the pocket (1") and where a portion (REC_{kik}) of the previously pressurised fluid is forwarded directly to a recovery system and where this portion constitutes at least 20% of the total amount (REC_{tot}) that is withdrawn for recovery, while being at least 1 m^3/tonne of pulp, with the aim of reducing the total amount of electrical energy required to pump the chips suspension from low pressure to high pressure through the sluice feeder.

AMENDED SHEET (ARTICLE 19)

CLAIMS

1. A method for the feed of a mixture of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp in which the feed between these systems occurs in that a sluice feeder (53") is arranged between these systems for the sluice feed of fluid and cellulose chips and where the sluice feeder (53") is equipped with a first inlet (53a"), a second inlet (53c"), a first outlet (53b") and a second outlet (53d"), and it comprises a rotor with through pockets (1", 2"), which are placed alternately in connection with the high-pressure system and the low-pressure system; where the first pocket (1") which is located at a first position is placed in connection in the low-pressure system with a chip bin (52") or with an impregnation vessel (3") essentially at atmospheric pressure while the pocket (1") is filled with the chips mixture, while at the same time expulsion of the fluid that is present in the pocket (1") takes place via the first outlet (53b"), and where the second pocket (2"), which is located at a second position and is placed via the second inlet (53d") in connection with a transfer line (6b") in the high-pressure system while the chips mixture is fed out from the pocket (2") for transport onwards to a treatment vessel (60") in the high-pressure system with the aid of a fluid that is fed into the pocket (2") through the second inlet (53c"), characterised in that the second inlet (53c") is connected via at least one withdrawal line (70) to the treatment vessel (60"), from which treatment vessel (60") pressurised fluid is withdrawn, and that the said pressurised fluid is used to expel chips mixture from the pocket (1") when the pocket is in connection with the high-pressure system and where the previously pressurised fluid is withdrawn from the first outlet (53b") of the sluice feeder from the pocket (1") and where a portion (REC_{kik}) of the previously pressurised fluid is forwarded directly to a recovery system and where this portion constitutes at least 20% of the total amount (REC_{tot}) that is withdrawn for recovery, while being at least 1 m^3/tonne of pulp, with the aim of reducing the total amount of electrical energy required to pump the chips suspension from low pressure to high pressure through the sluice feeder.

AMENDED SHEET (ARTICLE 19)

FIG. 1

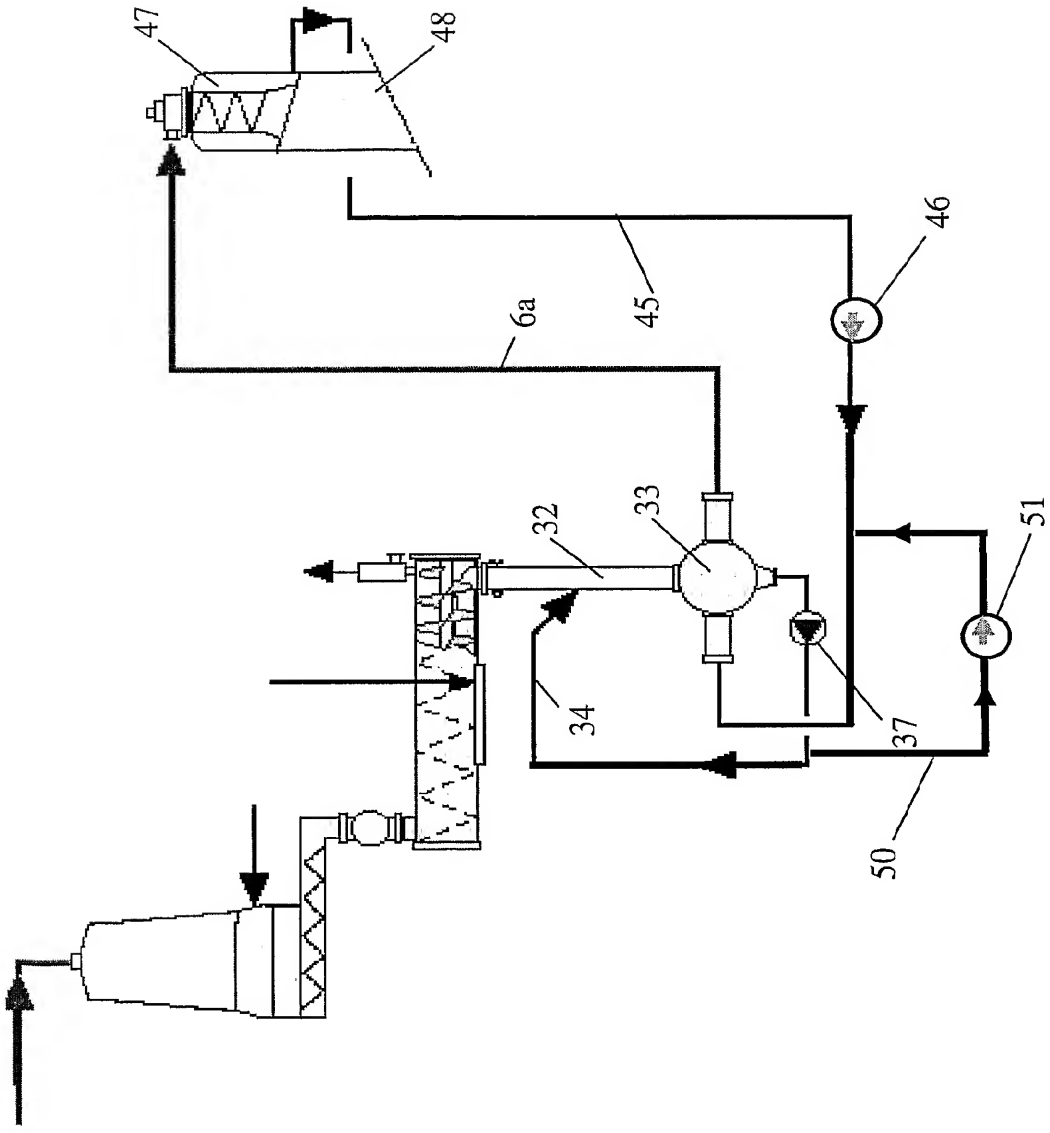
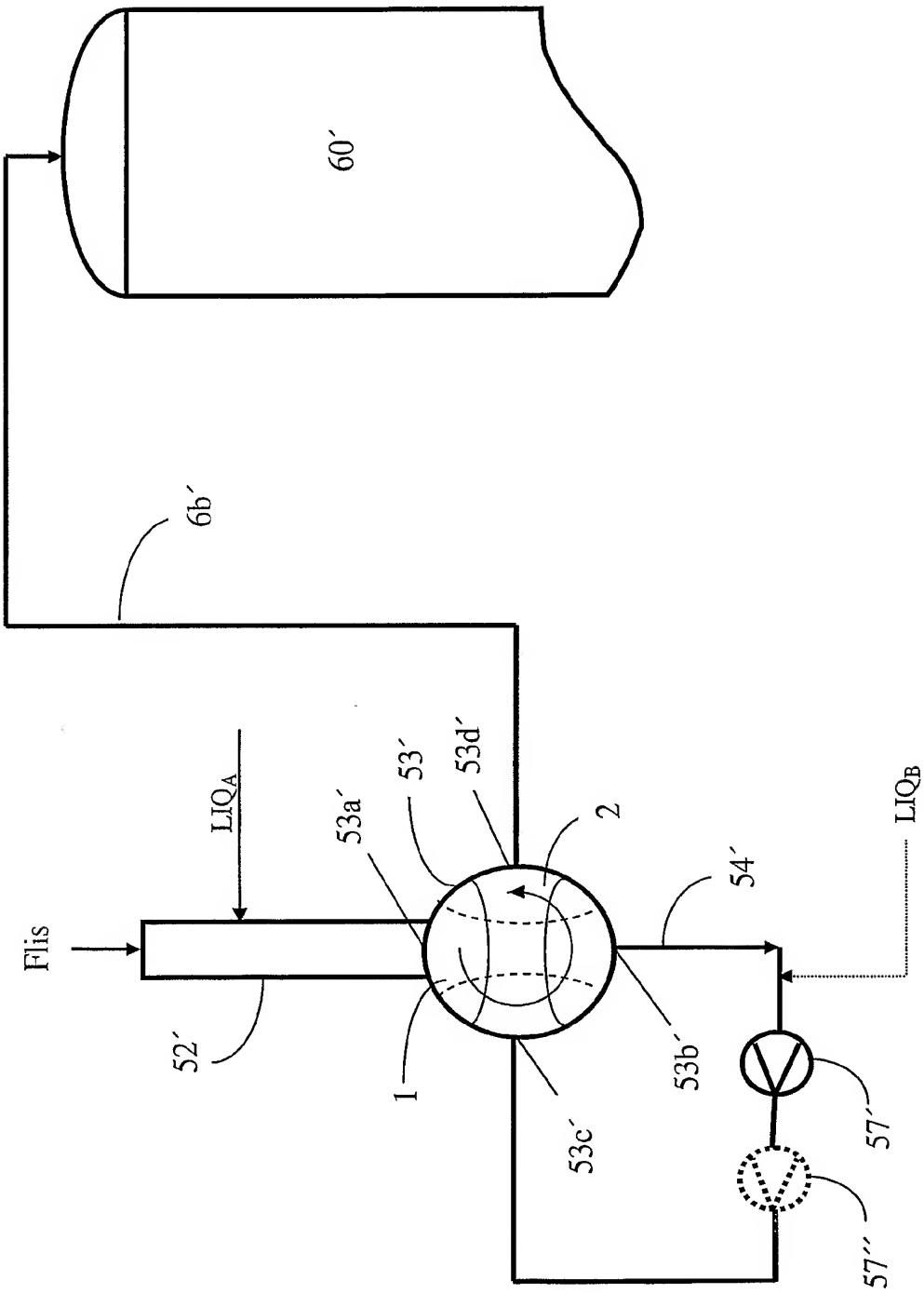


FIG. 2



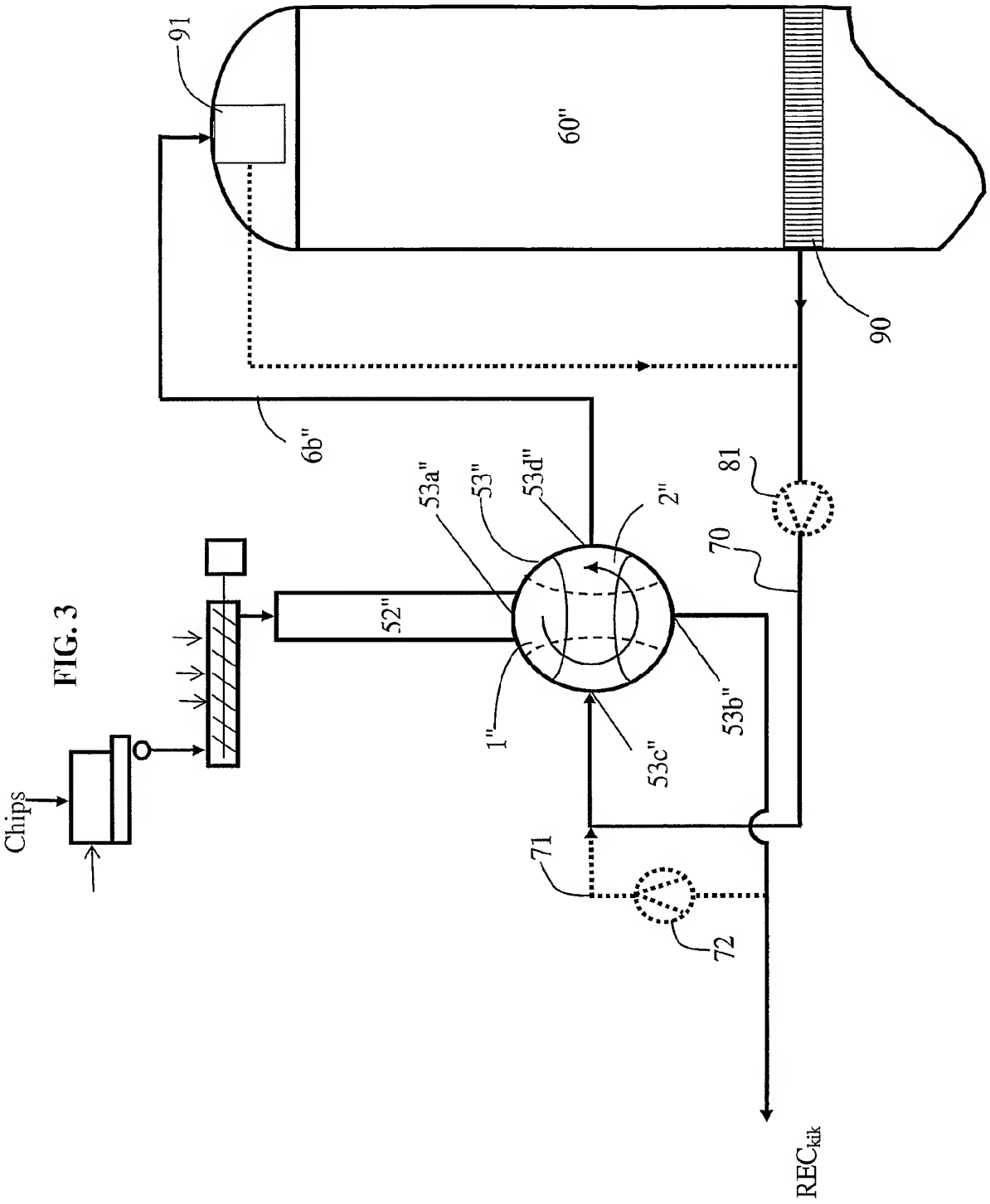


FIG. 3

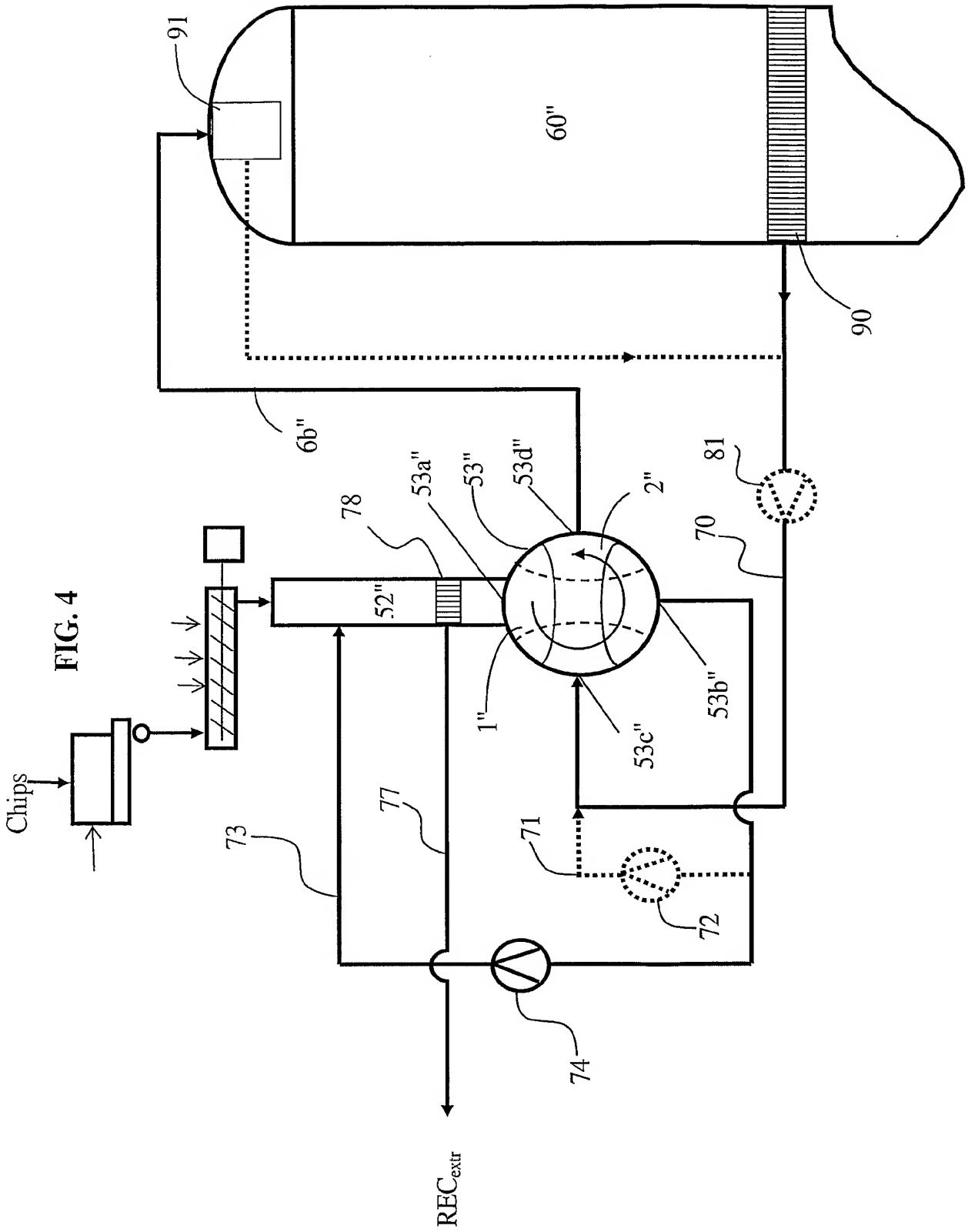
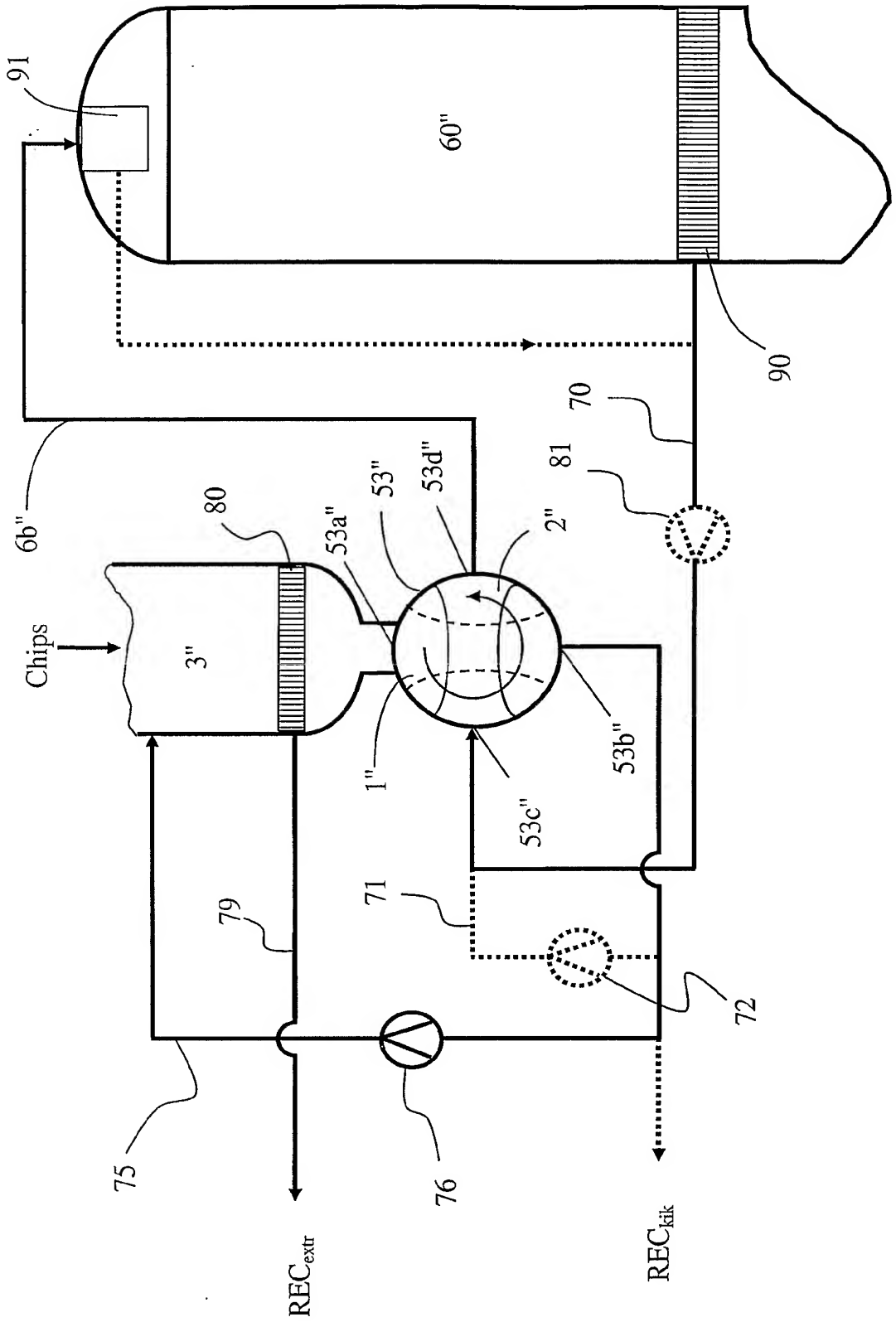

91
60"
90
6b"
81
53a"
53"
53d"
2"
78
70
52"
1"
53c"
53b"
Chips
77
73
71
72
74
REC_{extr}

FIG. 4

FIG. 5


91
60"
90
70
81
6b"
80
53a"
53"
53d"
2"
Chips
3"
1"
53b"
53c"
71
79
72
75
76
REC_{extr}
REC_{kik}

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
0308 PCT		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/SE 2004/001985	23 December 2004	30 December 2003
Applicant		
Kvaerner Pulping AB et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
      ☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,
   ☐ the text is approved as submitted by the applicant.
   ☒ the text has been established by this Authority to read as follows:

   Feed of a mixture of chips and fluid from a low-pressure system to a high-pressure system

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,
   a. the figure of the drawings to be published with the abstract is Figure No. 3
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/001985

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21C 7/06, D21C 3/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03062525 A1 (KVAERNER PULPING AB), 31 July 2003 (31.07.2003), page 6, line 7 - page 8, line 11, figure 2	1,3-5,7
X	US 3802956 A (E.A. BACKLUND), 9 April 1974 (09.04.1974), page 1, column 2, line 7 - line 27; page 2, column 3, line 38 - line 47, figure 1	1
A	US 5089086 A (R. SILANDER), 18 February 1992 (18.02.1992), figure 1	1-7
A	US 2901149 A (O.J. RICHTER), 25 August 1959 (25.08.1959), figure 1	1-7

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 March 2005	18 -04- 2005
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Marianne Bratsberg / MRo Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/001985

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4078964 A (S.T. GLOERSEN), 14 March 1978 (14.03.1978), figure 1	1-7

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WO	03062525	A1	31/07/2003	EP	1470288	A	27/10/2004
				SE	518957	C	10/12/2002
				SE	0200185	A	10/12/2002
				US	20040060672	A	01/04/2004
US	3802956	A	09/04/1974	CA	936309	A	06/11/1973
				DE	2112633	A,B,C	30/09/1971
				FI	54155	B,C	30/06/1978
				FR	2084755	A	17/12/1971
				JP	53024521	B	21/07/1978
				NO	129361	B	01/04/1974
				SE	359331	B	27/08/1973
US	5089086	A	18/02/1992	CA	2015538	A	27/10/1990
				FI	82079	B,C	28/09/1990
				FI	892019	D	00/00/0000
				JP	3130482	A	04/06/1991
				NO	172504	B,C	19/04/1993
				NO	901868	A	29/10/1990
				SE	9001467	A	28/10/1990
US	2901149	A	25/08/1959	FR	1173504	A	26/02/1959
US	4078964	A	14/03/1978	SE	377347	B,C	30/06/1975
				SE	7316617	A	11/06/1975

DERWENT-ACC-NO: 2005-533180

DERWENT-WEEK: 200731

TITLE: Method to pump a mixture of chips and fluid from low-pressure system to a high-pressure system during continuous cooking of chemical cellulose pulp involves use of pressurized fluid to expel chip mixture from a sluice feeder

INVENTOR: SNEKKENES V

PATENT-ASSIGNEE: KVAERNER PULPING AB[KVAEN] , SNEKKENES V[SNEKI]

PRIORITY-DATA: 2003SE-003582 (December 30, 2003)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
WO 2005064078 A1	July 14, 2005	EN
SE 200303582 A	July 1, 2005	SV
SE 526704 C2	October 25, 2005	SV
EP 1704277 A1	September 27, 2006	EN
US 20070095490 A1	May 3, 2007	EN

DESIGNATED-STATES: AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL P T RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW AT BE BG BW CH CY CZ DE DK EA EE ES FI FR

GB GH GM GR HU IE IS IT KE LS LT LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW AT BE BG CH CY CZ DE DK EE ES FI FR GB G R HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO2005064078A1	N/A	2004WO-SE001985	December 23, 2004
SE 200303582A	N/A	2003SE-003582	December 30, 2003
SE 526704C2	N/A	2003SE-003582	December 30, 2003
EP 1704277A1	N/A	2004EP-809158	December 23, 2004
EP 1704277A1	N/A	2004WO-SE001985	December 23, 2004
US20070095490A1	N/A	2004WO-SE001985	December 23, 2004
US20070095490A1	Based on	2006US-596660	June 20, 2006

INT-CL-CURRENT:

TYPE	IPC DATE
CIPP	D21C7/06 20060101
CIPS	D21C3/24 20060101
CIPS	D21C7/06 20060101

ABSTRACTED-PUB-NO: WO 2005064078 A1

BASIC-ABSTRACT:

NOVELTY - Method to pump a mixture of chips and fluid from low-pressure system to a high-pressure system during continuous cooking of chemical cellulose pulp involves use of pressurized fluid to expel the chip mixture from a sluice feeder; and subsequently sending the pressurized fluid to a recovery system.

DESCRIPTION - Feeding a mixture of chips and fluid from low-pressure system to a high-pressure system during continuous cooking of chemical cellulose pulp involves use of pressurized fluid to expel the chip mixture from a sluice feeder; and subsequently sending the pressurized fluid to a recovery system. The sluice feeder is arranged between these systems; and is equipped with two inlets and two outlets. The sluice feeder comprises a rotor with through pockets, which are placed alternately in connection with the high-pressure system and the low-pressure system. The first pocket is placed in connection in the low-pressure system with a chip bin or with an impregnation vessel at atmospheric pressure. The first pocket is filled with the chip mixture and at the same time expulsion of the fluid that is present in the first pocket takes place via the first outlet. The second pocket is placed via the second inlet in connection with a transfer line in the high-pressure system. The chip mixture is fed out from the second pocket for transport onwards to a treatment vessel in the high-pressure system with the aid of a fluid that is fed into the second pocket through the second inlet. The second inlet is connected via at least one withdrawal line to the treatment vessel, from which treatment vessel pressurized fluid is withdrawn. The pressurized fluid is used to expel chips mixture from the first pocket when the pocket is in connection with the high-pressure system. The pressurized fluid is withdrawn from the first outlet and at least 20% of the pressurized fluid is forwarded directly to the recovery system (1 m3/tonne of the pulp).

USE - For pumping a mixture of chips and fluid from low-pressure system to a high-pressure system during continuous cooking of chemical cellulose pulp (claimed).

ADVANTAGE - The method avoid use of high-pressure pumps in order to pump the fluid from low pressure to high pressure. In association with the transport of chips from the chip bin to the treatment vessel. The method

consumes little energy during the transport of the chip mixture.

EQUIVALENT-ABSTRACTS:

MECHANICAL ENGINEERING

Preferred Method: The principal portion of the pressurized fluid (preferably total fluid) is forwarded to the chip bin or impregnation vessel, which is at atmospheric pressure arranged before the sluice feeder. The pressurized fluid is withdrawn from the treatment vessel with a strainer. The chips have a retention time greater than 60 (preferably greater than 100) minutes. At least a portion of the pressurized is withdrawn from top of the treatment vessel. A recirculation line comprising at least one high-pressure pump extends from the first outlet to the second inlet of the sluice feeder for withdrawal of the pressurized fluid.

TITLE-TERMS: METHOD PUMP MIXTURE CHIP FLUID LOW PRESSURE SYSTEM HIGH CONTINUOUS COOK CHEMICAL CELLULOSE PULP PRESSURISED EXPEL SLUICE FEED

DERWENT-CLASS: F09

CPI-CODES: F05-A02A; F05-A02B;

SECONDARY-ACC-NO:
CPI Secondary Accession Numbers: 2005-161645